

REMARKS

Claims 1-9 are pending in this application, all of which are finally rejected.

The Rejection under 35 U.S.C. §112

Claim 5 is rejected under 35 U.S.C. §112 second paragraph. In particular, the Office Action states that it is not clear to which "liter" in "millimoles/liter" is applied. This rejection is respectfully traversed. It is a well established rule that "whether a claim is invalid for indefiniteness requires a determination whether those skilled in the art would understand what is claimed when the claim is read in light of the specification. See, *Morton International Inc. v. Cardinal Chemical Co.*, 28 USPQ2d 1190, 1194-1195 (Fed Cir. 1993). Referring now to the specification, page 9, lines 12 - 19 it is stated:

In general, the bridged metallocene procatalyst can be present in the reactor in an amount, expressed in terms of its transition metal content, of from about 0.0001 to about 0.02, preferably from about 0.0002 to about 0.015 and more preferably from about 0.00025 to about 0.01, millimoles/liter. Corresponding to these amounts of transition metal, the aluminoxane cocatalyst can be utilized in an amount of from about 0.01 to about 100, preferably from about 0.02 to about 75 and more preferably from about 0.025 to about 50, millimoles/liter.

One skilled in the art, upon reading claim 5 in light of the specification would be clearly apprized as to what is being claimed. More particularly, as the metallocene procatalyst is described as being in the reactor in a specified amount based on transition metal content, one skilled in the art would realize that the millimoles/liter is based upon reactor contents, including the monomeric reactants. Descriptive statements similar to that of the present application can also be found in U.S. Patent No. 6,147,025, col. 9, lines 43-57, and U.S. Patent No. 6,225,426 at col. 10, lines 16-30, thereby further supporting applicant's argument that the specification herein is sufficiently clear to those skilled in the art. Accordingly, reconsideration and withdrawal of the rejection of claim 5 under 35 U.S.C. §112, second paragraph is respectfully requested.

#### The Rejections under Prior Art

1. Claims 1, 6 and 9 are rejected under 35 U.S.C. §102(b) as being anticipated by U.S. Patent No. 5,064,797 (hereinafter, "Stricklen"). Stricklen discloses a process for producing polyolefins and polyolefin catalyst. The catalyst system includes aluminoxane and at least two different metallocenes, each having a different olefin polymerization termination rate constants in the presence of hydrogen.

However, claim 1 requires that: (1) ligand ( $\text{Cp}^1\text{R}^1_{\text{m}}$ ) is different than ligand ( $\text{Cp}^2\text{R}^2_{\text{p}}$ ), and (2) bridging group  $\text{R}^3$  contains at least two bulky groups. Stricklen neither discloses nor suggests that the ligands must be different and that the bridging group must contain two bulky groups. The Office Action states that "applicants do not define in the specification which groups are considered to be the claimed bulky group". This is not correct. At page 6 of the specification, it is clearly indicated that the bridging group  $\text{R}^3$  must contain at least two bulky groups. For a bridging group, for example,  $-\text{C}(\text{R}^4)(\text{R}^5)-$  the bulky groups are  $\text{R}^4$  and  $\text{R}^5$  such as a cyclohydrocarbyl group containing preferably from 6 to about 12 carbon atoms.

The final Office Action states that applicants do not define what the bulky groups are in the specification and that one having ordinary skill in the art cannot recognize the difference between bulky groups in the claimed process and the alkyl group disclosed by Stricklen.

However, the concept of bulkiness of substituent groups is a recognized one in organic chemistry and cannot be ignored. Those skilled in the art understand that bulky groups encompass those substituent groups which, like phenyl groups or other groups of relatively large geometry such as tert-butyl groups,

occupy considerably more three dimensional space than do methyl groups and similarly sized groups of relatively small geometry.

Applicants submit that the term "bulky" as used in the claim expression "bulky groups" would be readily understood by those skilled in the art as distinguishing relatively small substituent groups such as methyl from considerably larger groups such as phenyl. See, in this regard, annexed copy (Exhibit 1) of Collman et al., "Principles and Applications of Organotransition Metal Chemistry", University Science Books, Mill Valley, California, (1987), pp.69-70 ("Collman"). Figure 3.2 of Collman describes the Tolman cone angle  $\theta$  for phosphine complexes of transition metals. The cone angle describes the conical three dimensional space subtended by a metal-coordinated phosphine free to rotate about the metal-phosphorous bond. Table 3.1 of Collman presents the cone angles for a number of different groups bonded to phosphorus in the phosphine ligand. Taking methyl ( $\theta=118^\circ$ ) as a typical example of a nonbulky group, it will be seen from Table 3.1 that other nonbulky groups include, e.g., hydrogen ( $\theta=87^\circ$ ), methoxy ( $\theta=107^\circ$ ) and fluorine ( $\theta=104^\circ$ ). Similarly, taking phenyl ( $\theta=145^\circ$ ) as a typical example of a bulky group, other bulky groups include hexafluorophenyl ( $\theta=184^\circ$ ), *tert*-butyl ( $\theta=192^\circ$ ) and mesityl ( $\theta=212^\circ$ ). The concept of bulkiness of substituent groups, far from being arbitrary, is a recognized one in organic

chemistry. Therefore, those skilled in the art would therefore understand that bulky groups encompass those substituent groups which, like phenyl groups or other groups of relatively large geometry such as *tert*-butyl groups, occupy considerably more three-dimensional space than do methyl groups and similarly sized groups of relatively small geometry.

In contrast to this, Stricklen teaches at col. 7, lines 58-60 that bridging group R'' is a C<sub>1</sub>-C<sub>4</sub> alkylene radical, a dialkyl germanium or silicone or alkyl phosphine or amine radical bridging two (C<sub>5</sub>R'm) rings. There is no disclosure or suggestion of bulky groups on the bridging group or, for that matter, that the bridging group contains two bulky groups. Accordingly, Stricklen neither discloses nor suggests the invention as defined by claim 1. Reconsideration and withdrawal of the rejection of claims 1, 6 and 9 under 35 U.S.C. §102(b) are respectfully requested.

2. Claims 2-4, 5, 7 and 8 are rejected under 35 U.S.C. §103(a) as being obvious over Stricklen. This rejection is respectfully traversed.

The Office Action states:

Stricklen does not disclose that alkyl groups in the bridging group R are cyclic (col. 7, lines 58-60), instead of generally alkyl. However, it would have been obvious to one having ordinary skill in the art at the time the invention was made to have modified the Stricklen

process by using bridging R groups having cyclic alkyl since it is expected that using any alkyl group would yield similar results.

Applicants respectfully disagree with the argument presented in the office action. First, claims 2-4, 5, 7 and 8 depend directly or indirectly from independent claim 1, which is submitted to be allowable over the Stricklen reference for the reasons stated above. Stricklen neither discloses nor suggests that the bridging group contains bulky groups. Therefore, cyclic groups as components of the bridging group are also neither disclosed nor suggested by Stricklen. Accordingly, claims 2-4, 5, 7 and 8 are also allowable.

Moreover, Applicants respectfully submit that the Examiner has provided no evidence that it would be expected that bridging groups having cyclic components as claimed are equivalent to the compounds disclosed by Stricklen. As mentioned above, Stricklen neither discloses nor suggests that the bridging group contains bulky groups. Contrary to what is expressed in the Office Action, one skilled in the art would not expect a molecule with bulky substituent groups such as t-butyl, phenyl and the like, to behave chemically in the same manner as molecules with lower alkyl substituents like methyl or ethyl. And, as there is no disclosure or suggestion in Stricklen that the bridging group contain two bulky groups, there is certainly

no disclosure or suggestion that the bridging group contain cyclic groups. Accordingly, Stricklen does not provide support for even a *prima facie* case for obviousness. However, even if, *arguendo*, a *prima facie* case for obviousness had been presented, it would be rebutted by the evidence presented by applicants in the specification. Applicants have provided examples and comparative examples illustrating the superiority of the claimed invention with respect to polymerization. See, for example, applicants specification, Examples 17-21, 24 and 28-31 wherein the catalyst of the invention, containing phenyl groups as the bulky groups was tested for polymerization results. See pgs. 29-33.

In contrast, in comparative examples C to E (pages 34-35), a catalyst outside the scope of the invention containing non-bulky alkyl groups (methyl) was correspondingly tested for polymerization results.

The catalysts of the invention consistently demonstrated an advantageously lower Iodine Number associated with the resulting decene polyolefins. As stated in the specification at page 35:

As these data show, employing a catalyst outside the scope of this invention effects the rate of polymerization, monomer conversion and efficiency of hydrogenolysis during polymerization, thereby resulting in a significantly higher Iodine Number as compared to those 1-decene polyolefins obtained in Examples 17-21,

24, and 28-31 utilizing a catalyst within the scope of this invention.

Moreover, as stated at page 13 of the specification:

By carrying out the polymerization reaction in the presence of hydrogen and employing the catalyst herein, a hydrogenation step is eliminated and the liquid polyalphaolefins of this invention are substantially saturated and, therefore, possess a low iodine value, e.g., an Iodine Number of from about 0.0 to 10, preferably from about 0.1 to about 5, and most preferably from about 0.2 to about 3.

Nowhere in the Stricklen reference are such unexpected advantages disclosed or suggested.

Reconsideration and withdrawal of the rejection are respectfully requested.

#### The Double Patenting Rejection

Claims 1-9 are provisionally rejected under the judicially created doctrine of obviousness type double patenting over Claims 1-6, 9 and 10 of copending application No. 10/014,911.

Applicants will consider filing a terminal disclaimer when this rejection is no longer provisional.

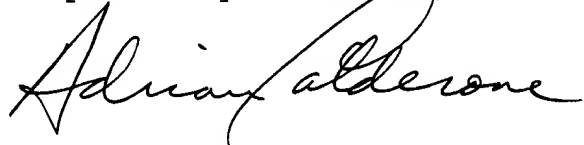


Appln. No. 09/637,791  
Amendment dated October 25, 2004  
Reply to the final Office Action of August 31, 2004

**CONCLUSION**

For at least the reasons stated above, all of the pending claims are submitted to be patentable and in condition for allowance, the same being respectfully requested.

Respectfully submitted,

A handwritten signature in cursive script, reading "Adrian T. Calderone".

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Attachments  
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## **APPENDIX**

# Principles and Applications of Organotransition Metal Chemistry

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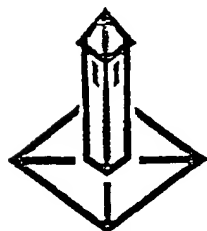
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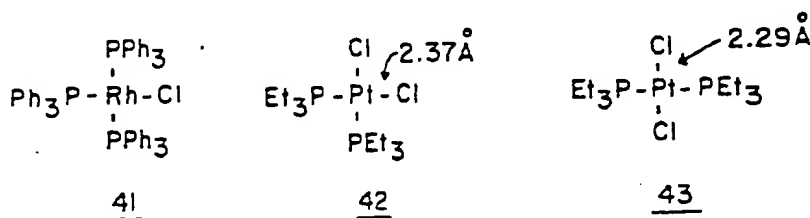
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10 9 8 7 6 5 4 3 2 1

Table 3.1. Phosphine Ligand Cone Angles

Phosphorus ligand	Cone angle $\Theta^\circ$	Phosphorus ligand	Cone angle $\Theta^\circ$
$\text{PH}_3$	87	$\text{PH}_2\text{Ph}$	101
$\text{P}(\text{OCH}_2)_3\text{CR}$	101	$\text{PF}_3$	104
$\text{P}(\text{OMe})_3$	107	$\text{PMe}_3$	118
$\text{PMe}_2\text{Ph}$	122	$\text{Ph}_2\text{PCH}_2\text{CH}_2\text{PPh}_2$	123
$\text{PEt}_3$	132	$\text{PPh}_3$	145
$\text{PPh}_2(t\text{-Bu})$	157	$\text{PCy}_3$	170
$\text{PPh}(t\text{-Bu})_2$	170	$\text{P}(t\text{-Bu})_3$	182
$\text{P}(\text{C}_6\text{F}_5)_3$	184	$\text{P}(\text{mesityl})_3$	212

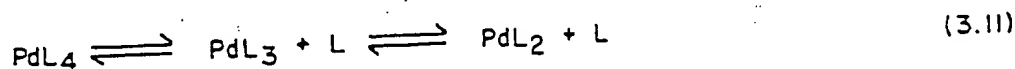
which are formed between tertiary phosphine ligands and transition metals. Consider, for example, the cis and trans platinum complexes 42 and 43. The Cl atom trans to phosphorus in 42 is further from the platinum, and is kinetically more labile, than the mutually trans Cl atoms in 43. Such trans effects are thus both structural and kinetic [48].



Various physical methods, such as IR (M-Cl) and the measurement of NMR coupling constants, have been used to detect such bond weakening. These trans effects are known for various metals in diverse oxidation states, including higher positive oxidation levels where  $\pi$  backbonding is unlikely. The pronounced thermodynamic tendency for pairs of phosphine ligands to bind trans to one another is doubtless a manifestation of this phenomenon.

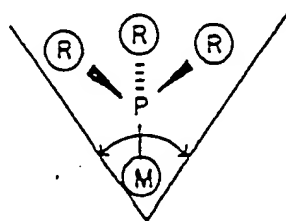
In contrast to aliphatic and aromatic phosphines,  $\pi$ -backbonding is significant among complexes of  $\text{PF}_3$  and, to a lesser degree, complexes of phosphites,  $(\text{RO})_3\text{P}$ . The electronegative fluorine atoms in  $\text{PF}_3$  lower the energy of the vacant phosphorus 3d orbitals, which results in strong backbonding with transition metals in lower oxidation

Bulky phosphines tend to bind trans to one another. The presence of several bulky phosphine ligands in the same coordination sphere can cause deviations from the idealized coordination geometry and often facilitates ligand dissociation. For example, the Wilkinson hydrogenation catalyst,  $\text{RhCl}(\text{PPh}_3)_3$ , 41, has a nonplanar arrangement of donor atoms in the solid state [47] rather than the square planar geometry expected for a  $d^8$ , Rh(I) complex. Dissociation of one phosphine from 41 is a key step in the operation of the Wilkinson catalyst. Another example of these steric effects is the extent of ligand dissociation for the palladium complexes (Equation 3.11). The extent of ligand dissociation increases in the order  $\text{PMe}_3 < \text{PMe}_2\text{Ph} < \text{PMePh}_2 < \text{PEt}_3 < \text{PPh}_3 < \text{P}(i\text{-Pr})_3 < \text{P}(\text{Cy})_3 < \text{PPh}(t\text{-Bu})_2$ .



The effect of steric interactions on the structural and physical properties of phosphine complexes has been extensively reviewed by Tolman [34], who proposed that the cone angle of a phosphine ligand should be used as a measure of its steric bulk (see Figure 3.2 and Table 3.1).

Figure 3.2



The electronic effects of tertiary phosphines depend markedly on the nature of the substituent atoms on phosphorus. Tertiary aliphatic and aromatic phosphines were once thought to stabilize transition-metal alkyl derivatives through  $d\pi$ - $d\pi$  backbonding in which filled metal d-orbitals interact with vacant d-orbitals on phosphorus. The possibility that  $\pi$ -backbonding is important in transition-metal complexes has been examined with several physical chemical techniques — IR and NMR spectroscopy and X-ray crystallography — for a great variety of metal phosphine complexes in various oxidation states. Although this issue cannot be said to be fully resolved, for simple tertiary phosphines there are very few instances where  $d\pi$ - $d\pi$  backbonding is required to explain the observed physical properties. Phenomena such as trans bond weakening that were once rationalized by  $\pi$ -backbonding can be explained by the strong  $\sigma$  bonds

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